ABSTRACT

In a solid solution system of Al_2O_3 and CAO or SrO, it has been difficult to obtain a material having a high electrical conductivity ($>10^{-4}$ $S \cdot cm^{-}$) at room temperature.

A compound is provided in which electrons at a high concentration are introduced into a $12CaO \cdot 7Al_2O_3$ compound, a $12SrO \cdot 7Al_2O_3$ compound, or a mixed crystal compound containing $12CaO \cdot 7Al_2O_3$ and $12SrO \cdot 7Al_2O_3$. The compound formed by substituting all the free oxygen ions with electrons is regarded as an electride compound in which $[Ca_{24}Al_{28}O_{64}]^{4+}(4e^{-})$ or $[Sr_{24}Al_{28}O_{64}]^{4+}(4e^{-})$ serves as a cation and electrons serve as anions. When a single crystal or a hydrostatic pressure press molded material of a fine powder thereof is held at approximately 700°C in an alkaline metal vapor or an alkaline earth metal vapor, melt of a hydrostatic pressure press molded material of a powder is held at approximately 1,600°C in a carbon crucible, followed by slow cooling for solidification, or a thin film of the compound held at approximately 600°C is implanted with rare gas ions, a great number of the free oxygen ions can be substituted with electrons.

FIG. 1 Y: ABSORPTION COEFFICIENT

X: PHOTON ENERGY

FIG. 2 Y: OPTICAL ABSORPTION (KUBELKA-MUNK)

X: PHOTON ENERGY

FIG. 3 TEMPERATURE (K)

ELECTRICAL CONDUCTIVITY (COMMON LOGARITHM)

TEMPERATURE (K^{-1})

FIG. 4 Y: ELECTRON BEAM CURRENT

X: ACCELERATING VOLTAGE